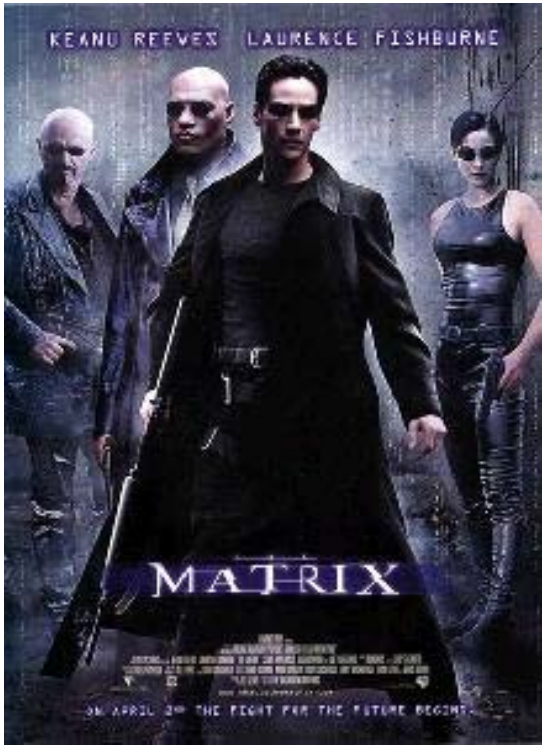
Converging Technologies

Nanotechnology, Biotechnology, Information Technology and Cognitive Technology - A New Controversy?



http://en.wikipedia.org/wiki/Image:The_Matrix_Poster.jpg

Karel Mulder

January 4, 2010

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Controversies

Luddites

In the 19th century- cycling

Insecticides

Nuclear energy

Nuclear weapons

IT

Meidcal biotechnology

Recombinant DNA

Windmills

http://en.wikipedia.org/wiki/Image:Luddite.jpg

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Controversies- why?

Lack of knowledge

Tendency to be irrational (based on linear thinking)

NO: social sciences indicate other reasons:

(Radical) new technologies lead to new normative questioning.

Are the risks accaptable

Distribution of advantages and disadvantages

Human metaphysics

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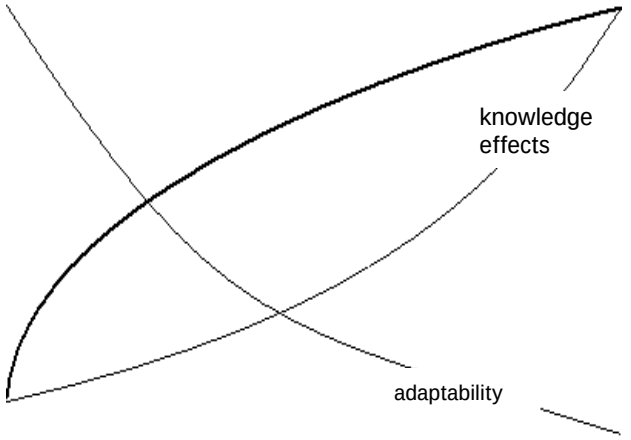
Control Dilemma

When technology has hardly been interpreted it is easy to make adjustments, but effects are not known yet.

When technology has been widely implemented, effects are known but it is very difficult to still make adjustment.



Technology Assessment:

Flexibility built into technology?

Trilema due to interactive processes?

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Value of Controversies

Public controversies can contribute to the quality of public decisions. Stakeholders must define their opinions and positions which leads to the defining of values and standards

The sooner an issue becomes controversial, the more can be done

If in the end no consensus is reached, the issue can become a taboo.

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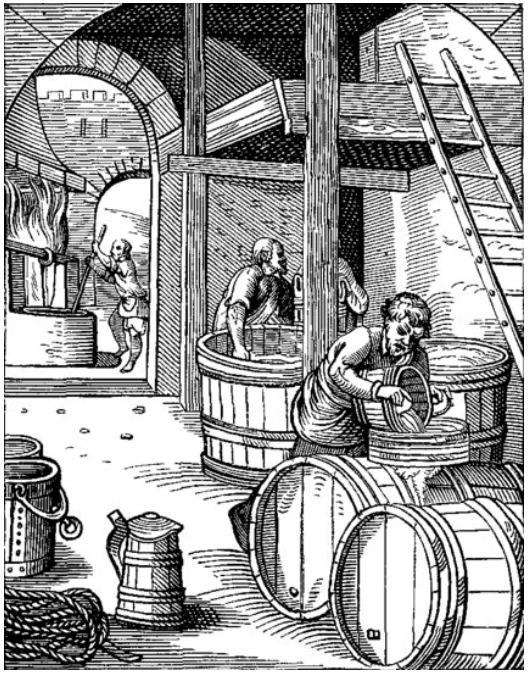
Value of Controversies

Thinking about converging technologies is important

- Nanotechnology
- Biotechnology
- Information technology
- Cognitive science

Human applications

Risk and fears



http://en.wikipedia.org/wiki/Image:16thCenturyBrewer.jpg

Brewing as an early example of biotechnology

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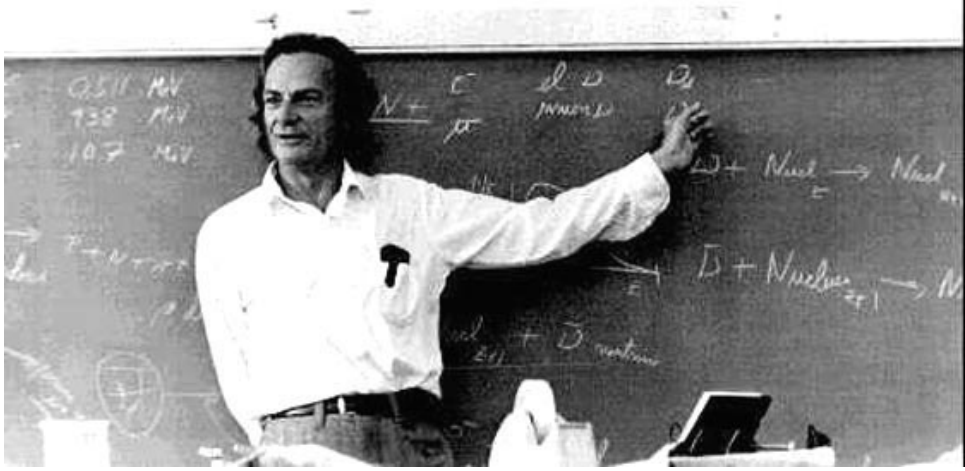
Nano Technologies- The Challenge

1959 - Richard Feynman,

Plenty of Room at the Bottom

When we get to the very, very small world - say circuits of seven atoms - we have a lot of new things that would happen that represent completely new opportunities for design.



http://lifeboat.com/images/richard.feynman.jpg

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Nano Technologies- The Challenge

Richard Feynman:

Now, you might say, `Who should do this and why should they do it?"

Well, I pointed out a few of the economic applications, but I know that the reason that you would do it might be just for fun.

But have some fun! Let's have a competition between laboratories. Let one laboratory make a tiny motor which it sends to another lab which sends it back with a thing that fits inside the shaft of the first motor.

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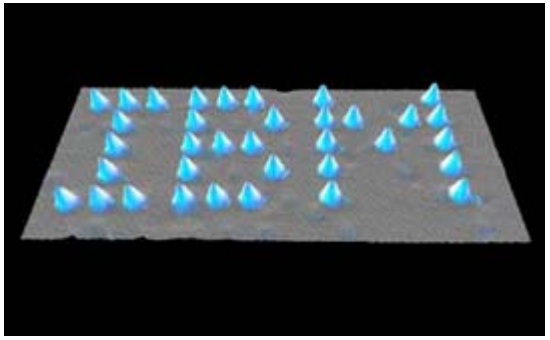
Nanotechnology- what is it?

Technology that manipulates at a molecular or macromolecular scale: 1-100 nanometer

1990: Xenon atoms



http://www.sciencemuseum.org.uk

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Nanotechnology- promising?

Production on molecular or atomic scale

- Materials
- Energy: fulecells, batteries
- Computer memory

Repairing on a molecular scale:

- ‘Lab on a chip’: constant health-monitors

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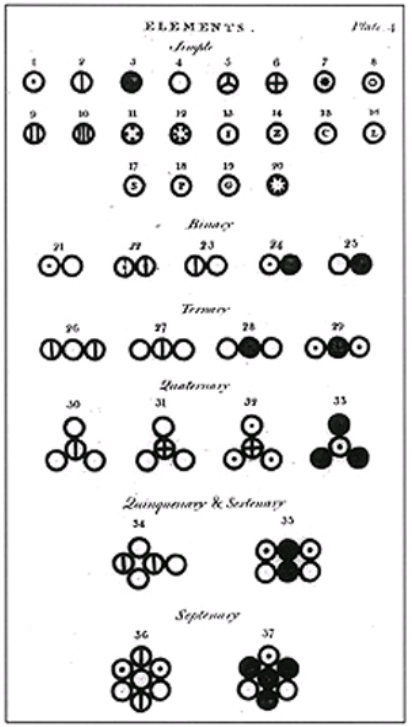
Nanotechnology- The ultimate Promise

Molecular Nanotechnology (MNT):

Building the world atom by atom



http://en.wikipedia.org/wiki/Image:A_New_System_of_Chemical_Philosophy_fp.jpg

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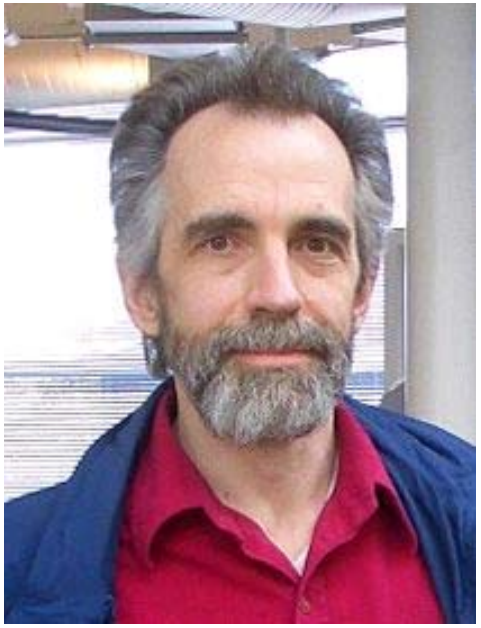
Nanotechnology- The Ultimate Promise

1986 - Eric Drexler, *Engines of Creation*

Self replicating machines: will robots take over?

Grey goo:

What if microrobots that auto-energize and self-replicate go out of control: will they transform the whole world in Grey goo?



http://en.wikipedia.org/wiki/Image:Eric_Drexler_2007.jpg

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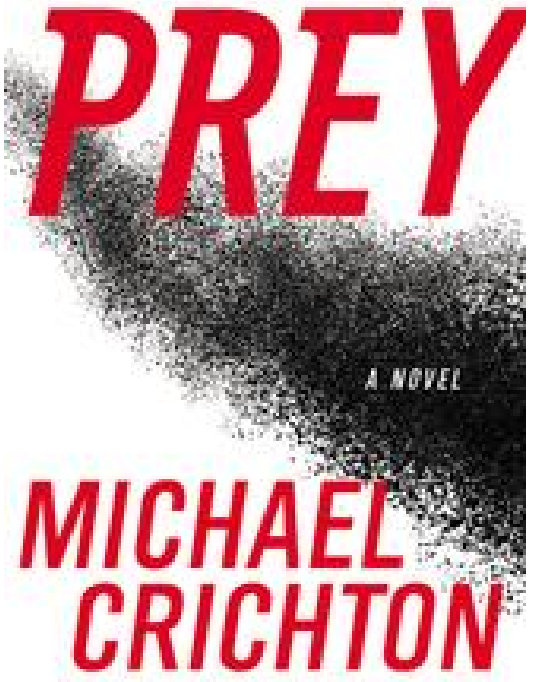
Nanotechnology- Invading Robots

Swarms of Robots that ‘ learn’

Readers are not ‘negative’ about this.



http://blackcatmisc.com/wp/wp-content/uploads/2007/12/michael_crichton_prey.png

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Nanotechnology- New Asbestos?

Huckzko A, Lange H, Calko E, Grubeck-Jaworska H, Droszez P [2001].

Physiological testing of carbon nanotubes: are they asbestos-like? Fullerene Science and Technology *9*(2):251 – 254.

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Biotechnology

Human genome documented

- Functions largely unknown
- Few therapeutic applications

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Information Technology

With increasing dataprocessing-possibilities cognitive processes become accessible.

Miniature hardware facilittes medical applications.

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Cognitive Science

Scanning techniques clarify brain activity

Holistic approach

Connecting nerves and electronics

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Cognitive Science- Technology and the Human body

Traditionally technology in human application is external: glasses/wheelchair

The mind is influences as a side effect of alcohol/drugs/anaesthetics

Nowadays behavior can be influences by medical intervention:

ADHD	-	Ritalin
Stress	-	Beta blocker
Addiction	-	?

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Cognitive Science

Consequences of Medicine influencing behaviour:

What behaviour is:

- acceptable?
- a medical problem?
- a social problem?

Medication to stimulate studying?

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Converging Molecular Nanotechnology

Molecular Nanotechnologie (MNT) in medical applications implies the convergence of biotechnology, nanotechnology and information technology

- MNT would ideally construct DNA-chains – optimalizing biotechnology
- MNT can process and write data on a molecular scale

But can also:

Link communication in the human body or in nature with computer networks.

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Perspectives

Repair (genetic) defects

Brain prothesis

Download information, instead of studying it

Copying the mind/our brains

Implementing our mind in a new body.

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Potential New Technologies

Fast developments in Brain – Computer interfaces

Connecting the nervous system

Implants for the senses

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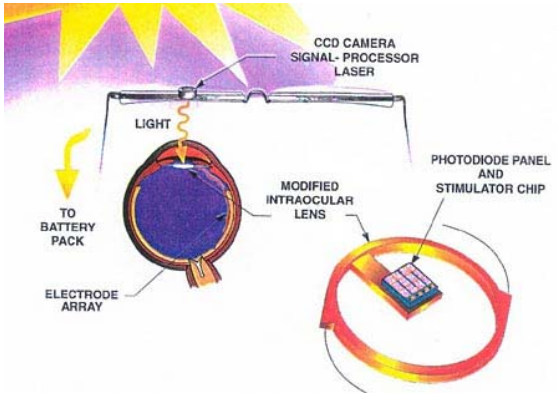
Neural Prosthesis

Cochlear implants

- Electronic ear
- Has been applied about 100.000 times
- Controversial in congenital deafness

Retinal Prosthesis

- 100*100 pixels now successfully applied



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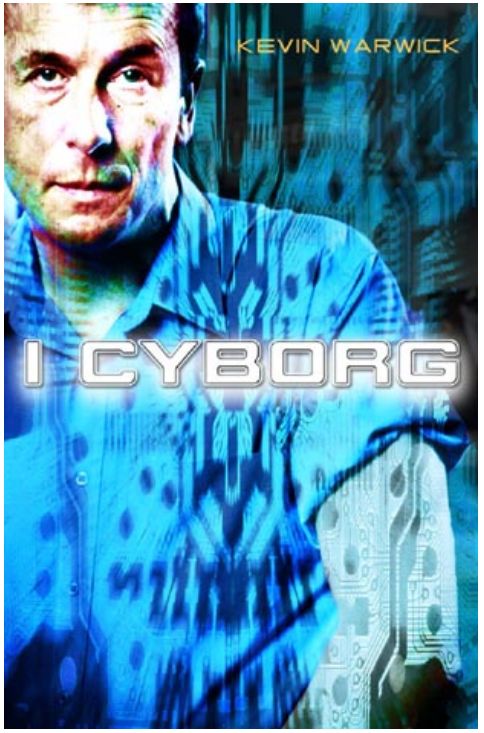
Kevin Warwick's Experiments

Studies on direct interfaces between computer systems and the human nervous system

- Controlling an artificial hand

What other options are there?

- Direct radio communication?
- Infrared communication?



http://bioethicsbytes.files.wordpress.com/2007/10/warwick-cover2.jpg

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More options

Recovery from a spinal cord lesion

Extra memory modules

But also: military cyborgs?

Use for defects and ‘enhancement’ are closely connected

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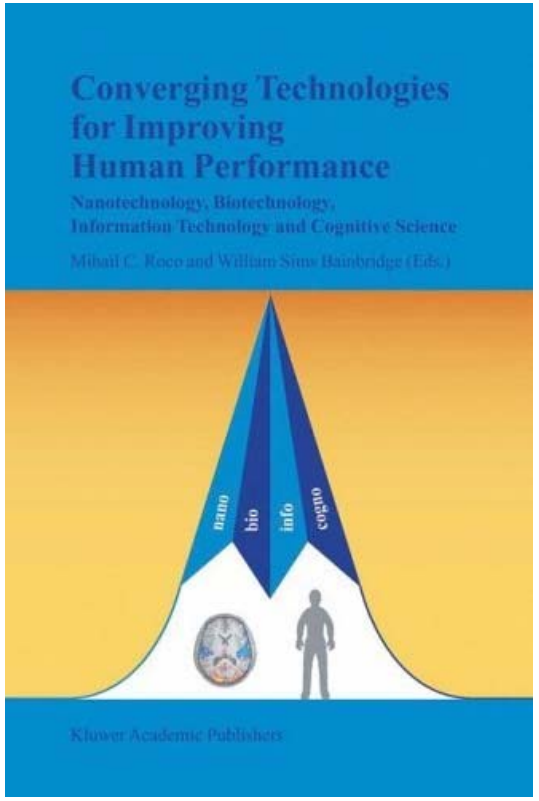
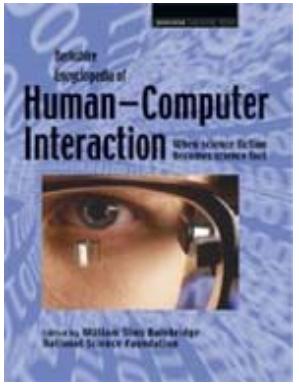
Nano, Bio, Information and Cognitive Technology Convergence

"…advances in genetic engineering, information systems, and robotics will allow archived human beings to live again, even in transformed bodies suitable for life on other planets and moons of the solar system."

Bainbridge, W. S. (2002). The spaceflight revolution revisited. In S. J. Garber (Ed.), *Looking backward, looking forward* (pp. 39-64). Washington, D.C.: National Aeronautics and Space Administration.





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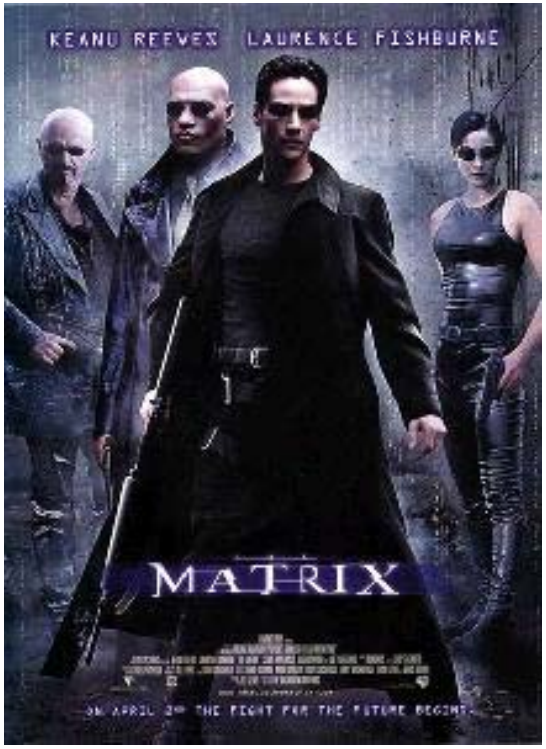
Actual Future or Horror?

Bringing frozen bodies back to life?

Traveling without your body?

What is reality if observations are machine-run (like in The Matrix)



http://en.wikipedia.org/wiki/Image:The_Matrix_Poster.jpg

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Actual Future or Horror?

Fears dictated by culture

Emotionless androids

Invasions by other life-forms

Monsters- Frankenstein

Boris Karloff as Frankenstein

http://www.solarnavigator.net/mythology/mythology_images/Frankenstein_monster_Boris_Karloff.jpg

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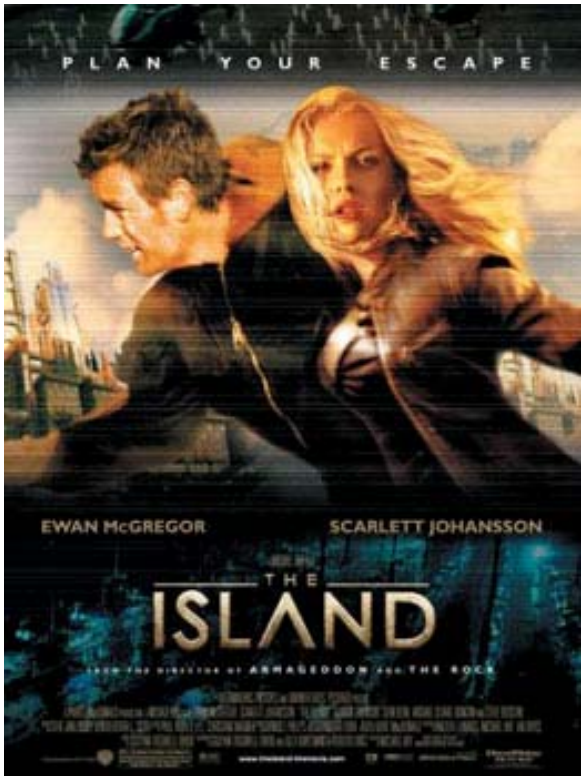
Films over Converging Technology

Ghost in the shell
Vanilla Sky
I robot
Battlestar galactica
Blade runner
The Island
Minority Report
The Matrix



http://www.vtm.be/films/header/the_island_affiche.jpg

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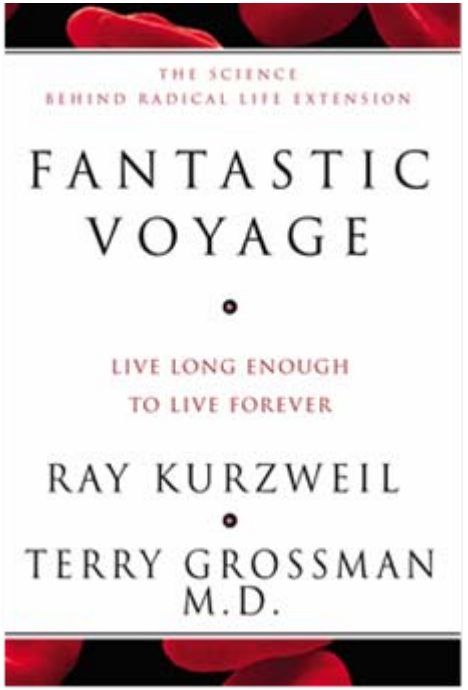
The Fans: Transhumanists and Kurzweil

Humanity is heading for a new destination, a new and faster evolution, via cyborgs

(Nearly) eternal life (4600)



http://www.fantastic-voyage.net/site/images/FronCover.gif

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Francis Fukuyama

The first victim of **transhumanism** might be **equality**. The U.S. Declaration of Independence says that “all men are created equal,” and the most serious political fights in the history of the United States have been over **who qualifies as fully human**. **Women** and **blacks** did not make the cut in 1776 when Thomas Jefferson penned the declaration. Slowly and painfully, advanced societies have realized that simply being human entitles a person to **political** and **legal equality**. In effect, we have drawn a **red line around the human** being and said that it is **sacrosanct.**

www.sais-jhu.edu

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Francis Fukuyama

Our **good** characteristics are intimately connected to our **bad** ones: If we weren't **violent** and **aggressive**, we wouldn't be able to **defend** ourselves; if we didn't have **feelings of exclusivity**, we wouldn't be **loyal** to those close to us; if we never felt **jealousy**, we would also never feel **love**. Even our **mortality** plays a critical function in allowing our species as a whole to **survive** and **adapt** (and transhumanists are just about the last group I'd like to see live forever). Modifying any **one** of our **key characteristics** inevitably entails modifying a **complex, interlinked package of traits**, and we will **never be able to anticipate** the ultimate **outcome**.

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Fundamental Question: The Meaning of Life?

A ‘brave New World’ with perfect, happy individuals where ‘ death’ will eventually be determined for a broken down ‘machine’?

Will there be room for religion in such a world?

A world like this will potentially create great inequality.

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Social and political reactions

Differences between the US and Europe

Nano, bio, information and cognitive technology report NSF:

- Strong technology push
- Improve human performance

CTEKS report EU panel

- Integration of technological potential, recognition of limitations, needs as a base and economical oppertunities

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More reactions

Critical report ETC group

Greenpeace

Several research subsidies

Industry is hesitant with regard to nanotechnology, and especially with regard to converged technolgies

A lot of technology assessment is taking place for nanotechnology programmes

The media, unitl now, are not getting involved

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Questions and controversies

Being able to diagnose, without being able to provide treatment.

Implications for healthcare costs and life insurance.

‘Brain hackers’

Risks of technology going out of hand?

Wil humanity be the ultimate goal of technology, or an evolutionary object?

Wil different ‘forms’ of the human race have different rights?

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Questions and controversies

Brave New world?

Deciding yourself about life and death? What about religion?

Inequality?

Freedom *to refuse* the application of converging technology?

Barriers to realize advantages?

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How to come to a decision?

Foresight-methods

Engage in a well-infomed debateDebat met goed basismateriaal